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ABSTRACT

Spelling performance was compared for 50 children who had hemiplegia sustained either prenatally (N=32) or postnatally (N=18) and for four children with hemispherectomies. The group study of subjects with hemiplegia divided the children into four groups based on hemispheric side and age at injury. This approach sought to investigate quantitative differences between groups and normal controls. Another approach examined the existence of qualitative differences between subjects who had undergone hemispherectomies during various stages of childhood. Results indicated that postnatally acquired left hemisphere lesions led to significant deficits in spelling ability. The nature and extent of this deficit was demonstrated by comparing spelling performance of early and late left hemispherectomy cases with equivalent right-sided cases. The magnitude of the impairment was much more pronounced the later in life the left hemisphere injury was sustained. (Author/CL)

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IS THERE A SENSITIVE PERIOD FOR THE ESTABLISHMENT OF LINGUISTIC FUNCTIONS IN THE RIGHT CEREBRAL HEMISPHERE?

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ABSTRACT

Young patients with histories of hemiplegias sustained prenatally or acquired postnatally,and others with hemispherectomies,were investigated with respect to spelling performance. The group study divided the patients into four groups on the basis of the variables of hemispheric side and age at injury. This approach sought to investigate quantitative differences between patient groups and normal control subjects. Another approach attempted to investigate the existence of qualitative differences between subjects who had undergone hemispherectomies during various stages of childhood. The dependent measure in every case was spelling performance.

Results indicate that postnatally acquired left hemisphere lesions lead to significant deficits in spelling ability.The nature and extent of this deficit is qualitatively demonstrated through the comparison of spelling performance of early and late left hemispherectomy cases with equivalent right sided cases. The magnitude of the impairment is much more pronounced the later in life the left hemisphere injury is sustained.

AIMS

1. To determine the effects of hemispheric side and age at injury on the representation of spelling skills.

2. To determine the existence of quantitative versus qualitative differences in spelling ability.

METHOD

Subjects

1. GROUP STUDY - HEMIPLEGICS

GROUPS	N	$\overline{X}$ AGE	$\overline{X}$ FSIQ	$\overline{X}$ (MQ)
PRENATAL LEFT	18	10.4	94	(83.5)
PRENATAL RIGHT	14	12.0	93	(94.7)
POSTNATAL LEFT	9	11.7	85	(72.1)
POSTNATAL RIGHT	9	11.9	91	(86.9)
NORMAL CONTROL	16	11.2	101	(96.5)

2. CASE STUDIES - HEMISPHERECTOMIES

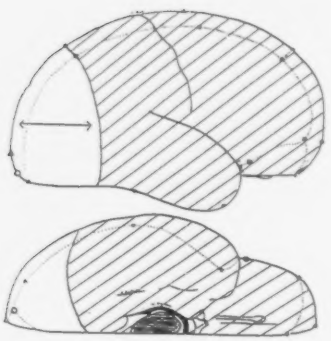
CASE	FSIQ	VIQ	PIQ	MQ
EARLY L	87	75	94	(61)
LATE L	63	59	71	(62)
EARLY R	79	92	69	(62)
LATE R	77	80	75	(83)

2. CASE STUDIES - HEMISPHERECTOMIES

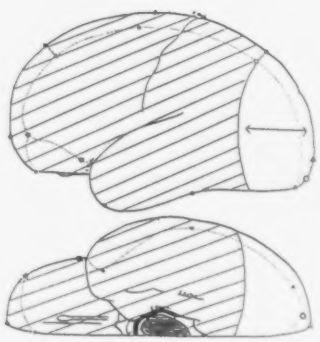
CASE	EPILEPSY ON SET YRS.	AGE SURGERY YRS.	AGE TESTING YRS.
EARLY L	4	6	16
LATE L	12	15	17
EARLY R	6	8	14
LATE R	11	15	17

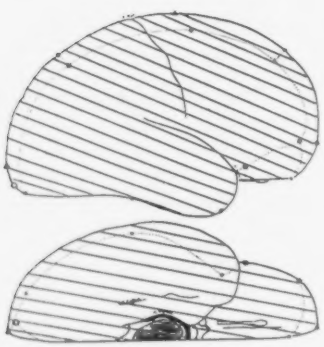
BRAIN MAPS OF SURGICAL EXCISIONS

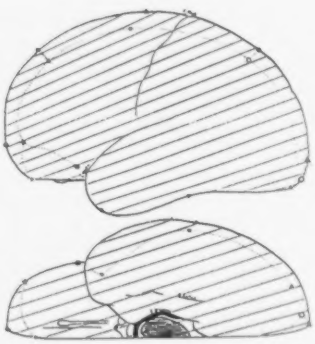
EARLY LEFT



EARLY RIGHT







LATE LEFT

LATE RIGHT

CASE STUDIES

Patients with early and late left hemispherectomies are severely impaired on the various measures of spelling ability.The magnitude of the deficit is more pronounced the later in life the lesion is sustained.

CASES	SPELLING AGE YRS. MS.	READING AGE YRS.MS.	SPELLING INFREQUENT WORDS %	SPELLING NONSENSE SYLLABLES %
EARLY L	6.9	7.5	0.06	16
LATE L	5.3	6.9	0	0
EARLY R	8.1	8.6	40	83
LATE R	10.7	11.1	53	83

REPRESENTATIVE SAMPLES OF SPELLING

INFREQUENT WORDS

	LATE RIGHT	EARLY RIGHT	EARLY LEFT
INTERVENT	intervent	intervent	inatven
CARPOLITE	carpolight	Carpallight	carpollit
TONOMETER	tonometer	tornter	lor
INTROVERT	introvert	intorvut	Intoorvert
BLASTMENT	blastment	Blastmant	blorstmint
LIGULATE	ligulate	liguate	lnjlat
POLARIZE	polawrse	Polorice	tpollerrts
STIMULUS	Semulase	Stimulass	stistlus
TITRATION	Irdaystion	tietryshon	tilerlast
EXPLICATE	explacate	Sxpecate	Xpleetplat
ISOTHERM	icelothum	iceolthum	kofarm
ASTROLABE	aslolab	aStrowlabe	sasatlap
EPITHET	epothat	apethurt	except
DISSONANT	dussolant	disonat	
RETROGRADE	retrograde	retrowgrade	

Tasks

1. Spelling to dictation -
   List of 20 frequent words -
   Phonetic and non-phonetic

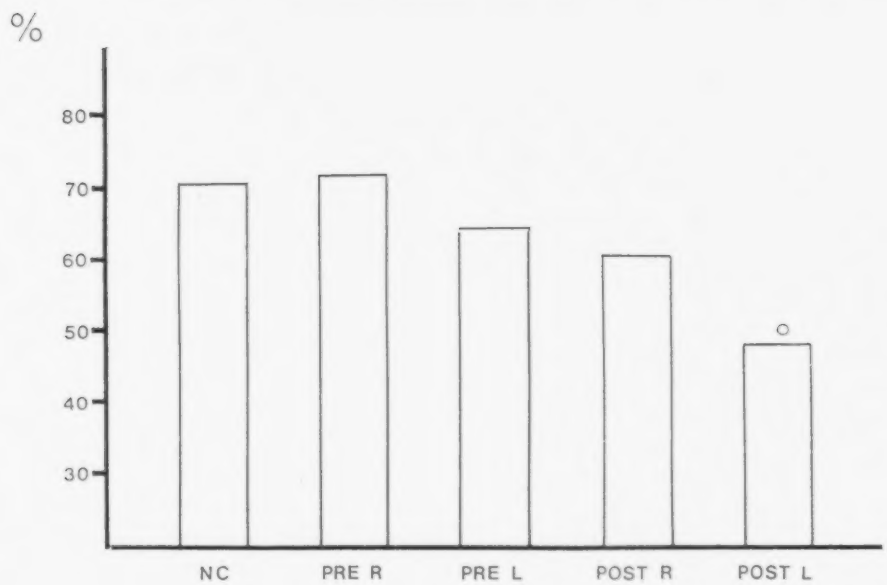
2. Spelling to dictation -
   List of 15 infrequent phonetic words

3. Spelling to dictation -
   Nonsense syllables

RESULTS

Group Study

Patients with postnatally acquired lesions of the left cerebral hemisphere are impaired in spelling both frequent ($P<0.03$) and infrequent ($P<0.06$) words.



o Significantly different from all groups except Post R

REPRESENTATIVE SAMPLES OF SPELLING

NONSENSE SYLLABLES

	LATE RIGHT	EARLY RIGHT	EARLY LEFT
SLOBSON	SLabsson	slobson	Sloopes
MOLSMIT	moLSmiL	mallsmitt	Milsip
PILSHEN	PiLShine	pillsan	pilares
VENCLEG	VencLege	vencleg	Frneg
KEPSTRUD	Kepstrud	cepstrod	Cecsoob
BALTRID	baLtrid	b@ltred	bootid
STANSERT	Stansort	sansurt	stansat
HINSHINK	hinshink	hinshink	hishig
QUILVIST	LuiLvist	qillvist	quilves
MIRBRECT	mirbreaked	mesbrict	meabret
KIPTHIRM	Kipthirem	kipthum	Ciffam
FRIZGUMP	frizgump		guffe

CONCLUSIONS

1. Left hemisphere lesions sustained postnatally result in the impairment of spelling performance.

2. This deficit is not only with respect to normal control standards, but also in relation to patient groups with prenatally sustained hemispheric lesions.

3. This pattern of performance is exaggerated in the case of patients who have undergone left hemidecortication. In the case of early left hemispherectomy, there is an abnormal pattern of phonetic analysis and phoneme to grapheme translation. In sharp contrast to this deviant pattern, there is a total inability to translate sounds to script in the case of the patient with late left hemidecortication.

4. The spelling performances of patients with right hemidecortication are relatively well preserved. It should be noted, however, that while spelling patterns are not deviant in such cases, reading and spelling standards are nontheless quite low. This is more evident in the case of hemidecortication carried out during early childhood. Obviously, the right cerebral hemisphere plays some role in the normal developmental standards of reading and spelling skills.